A NEW SPECIES OF *PAECILOMYCES* FROM SOIL

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(Received for publication on November 3, 1953)

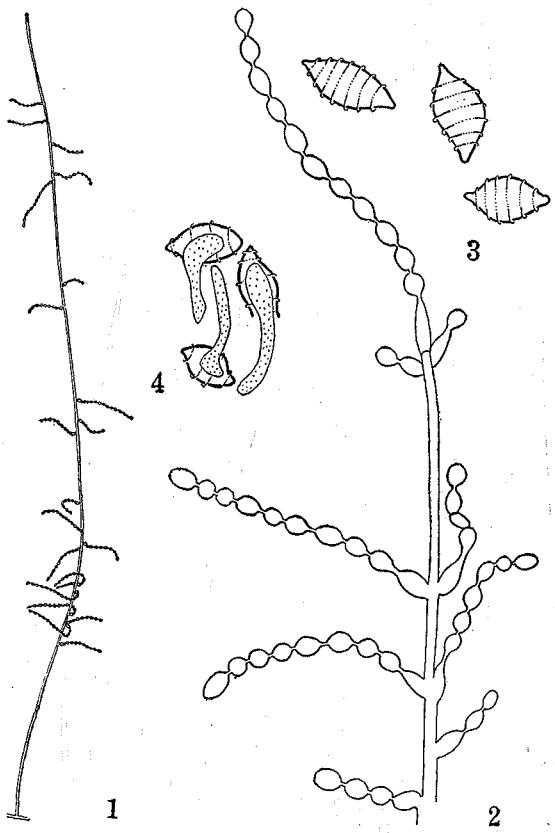
The genus *Paecilomyces* was established in 1907 by Bainer with the type species *P. varioti*. Since then much confusion has prevailed regarding the characters which delimit the genus. Raper and Thom (1949), who have paid considerable attention to this genus, mention in their manual (p. 692), "Viewed in conjunction with the descriptions and figures found in the literature, the structural type here recognized as *Paecilomyces* is seen to be cosmopolitan and is found described under several generic names, including *Corollium*, *Spicaria*, *Penicillium*, *Paecilomyces*, *Eidamia*, *Byssochlamys* and perhaps others. No one at present knows this group well enough to establish sound lines of relationship among them." The genus is widespread and has been isolated from diverse environments in nature. No detailed monographic study has been made so far and the literature remains scattered. The present species was isolated from a soil sample collected from Patharia forest near Sagar in Madhya Pradesh.

Material and Methods

The soil from Patharia forest was collected in August 1952, from a depth of about 3″ with a sterile spatula, packed in a sterile container and brought to the laboratory. The soil was plated in different dilutions in Petri dishes of several media. The fungus first appeared on Waksman's agar. Further isolation and purification was done on Czapek's agar on which detailed observations were recorded. The fungus was later grown on potato dextrose agar, soil extract agar, Waksman's agar and malt agar for noting any variations and characteristics on these culture media.

General Structure

The general structure of conidiophores (Text-Figs. 1–2; Pl. VIII, Figs. 2–4) agrees with the generic description of *Paecilomyces*. The shape of phialides (Text-Fig. 2; Pl. VIII, Figs. 2 and 4) is somewhat different. It resembles more the sterigma of a typical monoverticillate *Penicillium*, *i.e.*, it is a cylindrical cell with an acute more or less tapering apex rather than having a narrowed long neck as is described typically for the genus *Paecilomyces* (Raper and Thom, p. 47, Figs. 11 B and 11 D). But the arrangements and distribution of the phialides are typical of the genus. The most remarkable characteristic of this species is the pattern of markings on the walls of conidia (Text-Fig. 3; Pl. VIII, Fig. 5). The species so far described have smooth walls but here a characteristic and beautiful pattern of markings in the form of spiral bands from end to end is noticeable. In view of these observations the fungus is described as a new species of *Paecilomyces*.



TEXT-FIGS. 1–4. Fig. 1. Single conidiophore showing the formation of conidial chains, ×140. Fig. 2. Conidiophore showing the formation and shape of phialides and conidial chains, ×595. Fig. 3. Conidia showing the typical spiral markings on the wall, ×1,400. Fig. 4. Conidia, germinating, ×1,400.

Paecilomyces fusisporus sp. nov.

Colonies on Czepek's agar broadly spreading with medium rate of growth, completely occupying the Petri-dish in 10 days at room temperature, low growing, with superficial growth consisting mostly of trailing fertile hyphæ, faintly zonate, surface white at first later becoming cream and slightly brownish (Pl. 12–6 B); reverse of the same colour but more brownish (Pl. 13–7 B). Vegetative hyphæ branched, hyaline, 3–4 μ thick. Fertile hyphæ septate, branched, creeping. Conidial fructifications either terminal or on short branches of creeping or slightly erect hyphæ consisting of separate sterigmatic cells, or of verticils or series of verticils of branchlets and sterigmata irregularly distributed along the fertile hyphæ; sterigmata 10–15 × 3–5 μ with pointed apices bearing conidia in long chains 100–125 μ; conidia fusiform with the two ends usually pointed, 6–10 × 3–5 μ,

brownish in colour, walls thick showing characteristic spiral markings from end to end. The species is unmistakable on account of the markings on the spores.

Note.—The plates refer to Maerz and Paul's "Dictionary of Colour".

Colonies cultæ in Czapek medio late diffusæ, ratione increment media, omnino implentes Petri patinam diebus decem sub temperatura normali cubiculi, crescentes depresse, partes superficiales constantes ut plurimum hyphis fertilibus repentibus, tenuiter zonatæ, superficie primo albida, tum cremea, tandem tenuiter brunnea; pars aversa eiusdem coloris sed plus brunnea. Hyphæ vegetativæ ramosæ, hyalinæ, 3–4 μ crassæ. Hyphæ fertiles septatæ, ramosæ, repentes. Fructificationes conidiales terminales vel insidentes ramis brevibus hypharum repentium vel tenuiter erecterum, constantium cellulis sterigmatibus separatis vel verticillis vel seriebus verticillorum ramorum et stergimatum irregulariter distributorum ad hyphas fertiles; sterigmata 10–15 $\times$ 3–5 μ acuta ad apices, ornata conidiis in catenas longas 100–125 μ dispositis; conidia fusiformia utroque apice ut plurimum apice up plurimum acuto, 6–10 $\times$ 3–5 μ, brunneola colore, perietibus crassis ornatis lineis spiralibus characteristicis ex uno in alium apicem. Species distincta est ob sporarum signis.

Cultural Characteristics

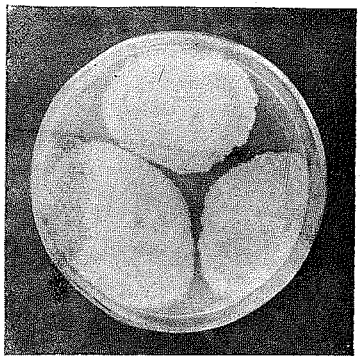
The fungus was grown on different media in order to note any variations or special characteristics. The fungus showed a fair constancy in the general morphology and range of measurements. The following peculiarities have been noted on different media.

*Soil extract agar**.—The radial growth was fast but the hyphæ were sparingly branched and conidiophores were also sparsely produced. The colony remained transparent without producing any marked thickness. Only a faint coloration developed in the older parts of colonies. The range of measurements of conidia and phialides remained the same as in Czapek's medium.

Malt agar.—The growth was fast. The succession of colour remained the same as in Czapek's agar but the shades were deeper; the reverse becoming almost black. In addition to the ordinary conidiophores, which are much branched and bear sterigmata and conidial chains all over, there were produced stiffer, unbranched dark brown conidiophores on which the phialides and conidial chains were crowded mainly towards the apical region (Pl. VIII, Fig. 3). Such conidiophores were few on Czapek's agar. Range of measurements of conidia and phialides remained the same.

Potato dextrose agar.—Growth was fast and colony thicker than on Czapek's agar, surface more flocculent, faintly zonate and colour darker, almost blackish on reverse in older colonies. Stiff conidiophores produced as in the case of maltagar.

* 1,000 gm. of dry soil was autoclaved in a litre of water for 30 minutes. The solution was allowed to stand, decanted and filtered. 20 gm. of agar was added to the filtrate and water added to make it to one litre. 0·2 gm. of K_2HPO_4 was added as buffer. The medium was then tubed and autoclaved.



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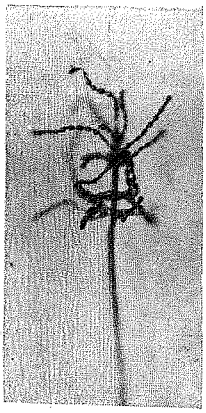

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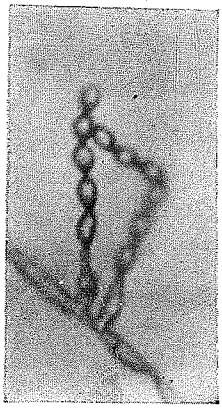

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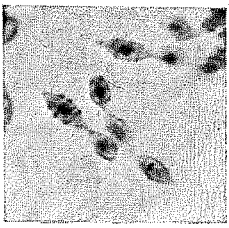

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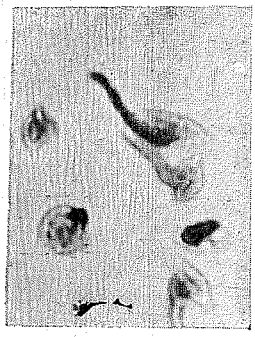

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Waksman's agar.—Growth was fast. The colony developed a distinct margin of about 3–4 mm. which was white and flocculent. Distinct zonations were formed which were discernible on the reverse as well. The colour succession remained the same but the shades were lighter. Stiff conidiophores were produced. The range of measurements remained the same.

Spore germination.—The germination was tried in pea decoction. The spores readily germinated in about 4–5 hours. Approximately 88% of spores were found to germinate. A single germ tube comes out from any part of the spore, *i.e.*, from apex or sides, by the rupture of the wall (Text-Fig. 4; Pl. VIII, Fig. 6). The outer ornamented thick wall remained unchanged except for the rupture or break. The inner wall produced the germ tube and the protoplasmic contents migrated into it. Growth and branching followed readily.

SUMMARY

A new species of *Paecilomyces* has been described. The conidia are fusiform in shape. They are characterised by a beautiful pattern of markings on the wall in the form of spiral bands from end to end.

Cultural characteristics were noted for several media. Besides the normal conidiophores a special type of stiff and sparingly branched conidiophores were also produced on several media. Germination of spores has also been studied.

ACKNOWLEDGEMENTS

The writer wishes to express his grateful thanks to Dr. R. K. Saksena of the Allahabad University for his valuable guidance and to Dr. Charles Thom for very kindly going through the descriptions along with the figures. His advice has been very useful. His thanks are also due to Prof. Fr. H. Santapau for the Latin diagnosis and to Dr. R. Misra for the facilities provided and kind encouragement.

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PLATE VIII

FIGS. 1–6. *Paecilomyces fusisporus* sp. nov.

FIG. 1. Colonies on Czapek's agar, 10 days old.

FIG. 2. Habit showing the branched conidiophores, arrangement of phialides and chains of conidia, ×150.

FIG. 3. Stiff conidiophores in which the phialides are crowded towards the apical region, ×150.

FIG. 4. Two phialides showing the typical shape and the chains of conidia, ×620.

FIG. 5. Conidia showing the fusiform shape and the typical spiral markings, ×750.

FIG. 6. Conidia, germinating, ×1,200.